

All-in-one cell phones: *not* a one-for-all panacea

IF YOU TAKE A SUFFICIENTLY POWERFUL AND FEATURE-EQUIPPED DIGITAL CELLULAR PHONE WHEN YOU HIT THE ROAD, CAN YOU LEAVE YOUR PDA AND NOTEBOOK PC BEHIND? IN MY CASE, THE ANSWER IS A RESOUNDING “NO WAY.” BUT IF YOUR NEEDS ARE MORE MODERATE, CELLULAR-CENTRIC SLIMMING MAY BE IN YOUR FUTURE.

A WOMAN LAUGHED AT ME the other day in a restaurant at the Seattle/Tacoma airport. I was simultaneously talking on my cell phone, entering data on my Pocket PC, and downloading e-mail over the local Wayport 802.11b network to my notebook computer. She looked at me with amusement. “Assuming you have to be doing all that work right now instead of reading a good book,” she said, “can’t someone make a single device that’ll handle everything you’re trying to do?”

The HBH-30 Bluetooth Headset looks better than it works (courtesy Sony Ericsson).



Figure 1

Her comments spurred me to act on her question, one that has been bugging me for some time. My wife and I both have Cingular Wireless GSM (Global System for Mobile Communication) accounts, and our cell phones are ancient Ericsson CF388s. I live in Sacramento, CA, one of the most competitive wireless markets in the country. It has at my last count eight contending service providers, and the local newspaper bombards me with dozens of ads every day showcasing all manner of phones and price plans. The digital cellular phone is, along with the PC, a dominant consumer of semiconductors. As the cell phone prospers or withers, therefore, so does the electronics industry.

Are people upgrading their phones only because they’re perpetually switching cellular providers and programs? Is their phone-to-phone migration simply motivated by the shrinking form factor, weight, and longer battery life of newer units? Or do some or all of the advanced features that my CF388 lacks—e-mail, WAP (Wireless Application Protocol), GPRS (General Packet Radio Service), infrared, and Bluetooth,

At a glance **68**

For more information **72**

for example—actually add value? I decided to find out.

INSPECTOR GADGET

A quick phone call to Sony Ericsson's PR department promptly resulted in the arrival of numerous boxes on my front porch. The company, a result of last year's merger of Sony and Ericsson, provided an HBH-30 Bluetooth headset, and a latest and greatest T68i phone with color display and built-in Bluetooth and infrared transceivers (**Figure 1**). Sony Ericsson also sent me a more mainstream T61z phone, I bought a refurbished T28 World phone for my wife at the Freecellularphoneaccessory.com Web site, and I picked up a DBA-10 Bluetooth adapter (compatible with both the T61z and the T28 World) on eBay (**Figure 2**). Both the T61z and the T68i support WAP, e-mail and GPRS capabilities, and all three phones offer voice recognition and PDA-like features, such as calendars, contact databases, and task lists (**Reference 1**).

Sony Ericsson also sent me a SIMM (single-inline-memory-module) card corresponding to an account that supposedly had Wireless Internet Express (Cingular's marketing term for GPRS) enabled, along with instructions for programming the account's GPRS and WAP parameters into the T68i. Wireless Internet Express fees begin at \$6.95 per month for as much as 1 Mbyte of data transfers, with an incremental cost of 3 cents per kilobyte beyond the first megabyte, and GPRS use doesn't subtract from your regular packaged-rate-plan minutes. You can access the Internet both from your

AT A GLANCE

- ▶ Are folks upgrading their phones only because they're perpetually switching plans and providers, as a fashion statement, or because they find tangible value to the added features?

- ▶ The benefits of Bluetooth headsets are unclear, both figuratively and literally.

- ▶ E-mail and World Wide Web access is problematic, both within the phone and from a computer.

- ▶ Advanced capabilities have limited value and sometimes require recipient compatibility.

- ▶ Economic and technical factors combine to make the path to high-speed wireless WANS a poorly marked and complex passage.

computer (using the phone as an intermediary wireless modem) and directly from the phone through its e-mail and WAP-client software.

Wireless Internet Express also includes Wireless Internet (Cingular's term for GSM Data services) for areas that lack GPRS support. Wireless Internet normally costs \$4 per month, and its use accrues airtime minutes. As with GPRS, you can access e-mail and Web sites over GSM Data services both directly from the phone and—through the phone—from your computer, a capability called CSD (circuit-switched data).

I put the Sony Ericsson-supplied SIMM into the T68i, upgraded my personal Cingular account to include GPRS GSM Data capabilities, and moved my SIMM from the CF388 to the T61z and my wife's SIMM from her CF388 to the T28 World. Initially, I concentrated my evaluation efforts on the T68i, whose integration and form factor reflect quite an amazing engineering achievement. At 100×48×20 mm (3.94×1.89×0.7 in.) and 84g (2.96 oz), the T68i packs a tremendous amount of capability into a form factor that unobtrusively slips into a shirt pocket. The T68i's diminutive size means that when I hold it to my ear, it's several inches away from my mouth, but the directional microphone still clearly picks up my voice. The T61z and T28 World are quite minuscule, too, especially compared with the CF388. All three of these advanced phones pass basic telephone tests with flying colors. But what about all those extra features?

STATIC FILLING MY ATTIC FROM CHANNEL B

The HBH-30 Bluetooth headset looks like something from a *Star Trek* Borg ensemble, so naturally it captured my attention first. Pairing the headset with the phones was a no-brainer after following the supplied discovery instructions. *Keeping* the headset paired, unfortunately, was more difficult. I estimate that at least one-third of the times I tried to use the HBH-30 with any of the phones, the phone and headset wouldn't find each other, and the phone would revert to using its own speaker and microphone. I'd have to power-cycle one or both units, unplug



Figure 2

The T68i (a), T61z (b), and T28 World (c) phones, the last two in conjunction with a DBA-10 Bluetooth adapter (d), formed the foundation of this hands-on evaluation (courtesy Sony Ericsson).

and replug the DBA-10 if it was in use or, in rare cases, force the headset back into its “discoverable” mode and again pair it with the phone before I could restore a successful Bluetooth connection.

Once the phone and headset were talking to each other, my experiences with them didn’t improve much. Even in environments without obvious RF interference, the headset microphone, which seems to be surprisingly nondirectional, picked up significant amounts of ambient noise, such as wind, passing pedestrians, and automobiles. Unless my surroundings were unnaturally quiet, I’d invariably need to transfer the incoming and outgoing audio back to the handset so that I could have a reasonably audible conversation.

Nearby sounds weren’t the only environmental factor that led to Bluetooth headset frustration. My 802.11b LAN, 2.4-GHz headphones, and microwave oven all significantly degraded the sound quality when they were operating and I was in their vicinity (**Reference 2**). Unlike data packets, which the recipient can if necessary request that the sender retransmit, voice conversations are isochronous, and resending is impossible. Strictly speaking, I guess they’re not *completely* isochronous; I can always tell the person on the other line “I can’t hear you. Say that again?” Retransmit requests of this nature get real old fast, though.

SUCKING THROUGH A SLENDER STRAW

Because the ability to retransmit is fundamental to the concept of data networks, I thought I might have better luck if I tried using the phones as wireless modems. After first getting stuck in a lengthy “infinite loop” wherein I told the Sony Ericsson PR team that I was getting GPRS-log-in errors and they assured me that the configuration information they had given me was correct, I stumbled across the excellent Web site of cell-phone guru and Navas Group founder John Navas and the alt.cellular.cingular and alt.cellular.ericsson newsgroups, where answers to my configuration questions awaited. After I made numerous calls to Cingular’s customer support line, I found out that the Sony Ericsson-supplied account apparently wasn’t provisioned for GPRS, and, for some reason that I still can’t figure out, the log-in information

supplied for the account is invalid. Navas’ Web site provided generic log-in and password codes that did work, however.

I manually entered the GPRS information into the T68i and the T61z. (Note that the Cingular-configured information added to my account on the T61z is user-inaccessible and usable only for the phone’s built-in e-mail and WAP functions.) I then set up relevant dial-up networking profiles on my Casio E-125 Pocket PC (using a Sharp CompactFlash Bluetooth card) and my NEC Versa UltraLite notebook PC (using a Belkin PCMCIA Bluetooth card). Unfortunately, Bluetooth-connectivity woes, which I first noted with the headset, have continued with the computers. Although the notebook PC and phones consistently find each other, I need to again pair the phones and Pocket PC nearly every time I want to use them together. Neither the notebook PC nor the Pocket PC software stacks support the HBH-30 headset profile, either, although, practically speaking, I’m not sure why I’d want to use the headset with anything but a cellular phone. Once I got the computers and phones talking to each other over Bluetooth, though, I was able to make reliable GSM Data connections to access e-mail and Web sites.

GPRS is less reliable; Cingular’s DNSs (domain-name servers) are frequently offline. I can hard-code other DNS addresses into the notebook PC to get around the problem, but, for some reason, this hack doesn’t work with the Pocket PC. While debugging the DNS



Figure 3

Chatboards add to the phone’s bulk but obviate tedious and repetitive keypad pressing (courtesy Sony Ericsson).

server problem, I also tried connecting phone and notebook computer via the DCU-10 USB cable and came across another baffling quirk: The NEC Versa UltraLite and its Windows 2000 operating system reliably acknowledge USB-cable insertions, but they fail to discern the wireless modem—that is, the cellular phone—on the other end of the cable. They discover the phone only when I manually initiate a search for new hardware or switch to an infrared connection. And on the same topic, Ericsson’s computer-based Phone Settings software only occasionally and sporadically finds the T61z over either Bluetooth or USB, though it reliably interacts with the T68i over Bluetooth as long as my 802.11b network isn’t in close proximity.

At 9600 bps, GSM Data doesn’t come within even two orders of magnitude of swamping the available Bluetooth bandwidth—or, for that matter, within an order of magnitude of overwhelming a 115.2-kbps infrared connection. GPRS bandwidth, although also far below the Bluetooth capacity, is more complicated to determine. GPRS uses one or multiple “time slots,” each of which can deliver

9.05 to 21.4 kbps of bandwidth, depending on signal quality and the corresponding error-correction scheme in use (**Table 1**). Cingular’s documentation indicates

that the company’s GPRS network supports a minimum of two dedicated downstream time slots and one dedicated upstream time slot, with as many as four additional downstream time slots dynamically available based on voice congestion and market configuration (**Reference 3**).

Available network resources don’t paint the entire GPRS bandwidth picture, though. You also need to look at how many time slots the phone supports



Figure 4

A camera add-on supports QQVGA (quarter-quarter-quarter-VGA) to VGA resolutions and 24-bit color depth (courtesy Sony Ericsson).

(Table 2). The T61z, a Class 4 device, handles as many as three downstream time slots and one upstream time slot. The T68i, a Class 8 device, can use as many as four downstream time slots and one upstream time slot. With both phones, I obtained 25 to 30 kbps of downstream bandwidth across a variety of usage environments, locations, and times of day, suggesting that the network, not the phone, was the bottleneck. Cingular's documentation echoes my experiences, suggesting that users should typically experience 10 to 30 kbps of download bandwidth.

PICK A PROVIDER

Although GPRS is roughly three times faster than GSM Data and although its use coexists with active voice-phone connections, I'll likely be relying on GSM Data most of the time. Recall that, for \$6.95 in addition to the required minimum \$19.95 charge for voice services, I can transfer only 1 Mbyte of data using Wireless Internet Express and that each additional megabyte costs almost \$31. Compare that cost with a \$43.95 Wireless Internet-inclusive phone plan, which includes 500 peak and 3500 off-peak (9 p.m. to 7 a.m. on weekdays and all day on weekends) minutes. The 9.6-kbps bandwidth means that I can in a best-case scenario transfer 72 kbytes of data per minute, and, therefore, if I use my calling plan only for data, it enables me to transfer nearly 275 Mbytes of data before I be-

gin accruing additional, expensive 45-cent/minute charges.

Will I reliably obtain transfer rates near 9600 bps? Will I use my cell phone *only* as a wireless modem, not as a voice telephone? And will I be content to access the Internet only during off-peak hours for seven-eighths of the month? Pragmatically, the answer to all three of these questions is "no." But even under more realistic usage scenarios, the cost advantage of GSM Data over GPRS remains significant. If GPRS' per-megabyte costs were lower, if GPRS download speeds were higher, and if I regularly used applications that demanded higher bandwidth, such as streaming multimedia, a comparison of the two services might yield different results. Note too that Cingular doesn't support HSCSD (high-speed circuit-switched data), another 2.5G (second-and-a-half-generation) data service, which, like GPRS, employs multiple time slots, each 9600 bps in this case, but makes less efficient use of network resources.

To gain a complete picture of the wireless-data-services landscape, you should also compare GPRS and GSM Data with alternatives, such as CDPD (cellular dig-

ital-packet data), Ricochet, and 802.11b. CDPD, which runs on the AMPS (Advanced Mobile Phone Service) analog cellular network, delivers 19.2-kbps peak-transfer rates. An unlimited-use, Verizon-only CDPD account costs \$39.95 per month

from GoAmerica. Use of the more pervasive AT&T network costs \$59.99 per month, but beware of roaming charges, which you will accrue if you inadvertently hook up to a Verizon or other non-AT&T node. Free, 11-Mbps 802.11b access is extensive, albeit somewhat inconvenient, in Silicon Valley and other tech-friendly locales. Check out the Bay Area Wireless Users Group Web site and my favorite early-morning and late-evening abode, Dana Street Roasting Co in Mountain View, CA. And several-hundred-kilobit-per-second, unlimited-use Ricochet, which recently became available again in Denver, costs \$44.95 per month (Reference 4).

The Navas Group's Navas reminded me of another high-speed wireless option: CDMA IS-95B, which Verizon and Sprint PCS now offer. I've never used CDMA (code-division multiple access), but, according to Navas, both vendors offer unlimited-use data plans at \$99 per month in addition to a variety of metered-data plans. He says that the typical downloading speed is approximately 30 to 60 kbps—a bit higher than that of GPRS. As a frequent WAP user, he correctly points out that GPRS works well

TABLE 1—GPRS-CODING SCHEMES

Channel-coding scheme	CS-1	CS-2	CS-3	CS-4
Precoding uplink state flag	3	6	6	12
Infobits without uplink state flag	181	268	312	428
Parity bits before coding	40	16	16	16
Tail bits	4	4	4	-
Output from encoder	456	588	676	456
Punctured bits	0	132	220	-
Code rate (%)	1/2	~2/3	~3/4	1
Data rate (kbps)	9.05	13.4	15.6	21.4
Maximum data speed with eight time slots (kbps)	72.4	107.2	124.8	171.2

FOR MORE INFORMATION...

For more information on products such as those discussed in this article, go to www.edn.com/info and enter the reader service number. When you contact any of the following manufacturers directly, please let them know you read about their products in *EDN*.

- Cingular Wireless**
1-408-544-7000
www.cingular.com
Enter No. 360
- Sony Ericsson**
1-408-441-0311
www.sonyericsson.com
Enter No. 361
- OTHER COMPANIES MENTIONED IN THIS ARTICLE**
- Aerie Networks**
www.aerienetworks.com

- America Online**
www.aol.com
- AT&T**
www.att.com
- Bay Area Wireless Users Group**
www.bawug.org
- Belkin**
www.belkin.com
- Casio**
www.casio.com

- Dana Street Roasting Company**
www.live.com/danastreet
- eBay**
www.ebay.com
- Extended Systems**
www.extendedsystems.com
- Freecellularphone accessory.com**
www.freecellularphoneaccessory.com
- GoAmerica**
www.goamerica.net

- The Navas Group**
<http://navasgrp.home.att.net>
- NEC**
www.neccomp.com
- Pacific Bell**
www.pacbell.com
- Ricochet Wireless**
www.ricochet.net
- Sharp**
www.sharp-usa.com
- Sprint**
www.sprint.com

- Verizon**
www.verizon.com
- Wayport**
www.wayport.com
- Yahoo**
www.yahoo.com

SUPER INFO NUMBER

For more information on the products available from all of the vendors listed in this box, enter no. 362 at www.edn.com/info.

with sporadic, small data transfers, such as Web browsing, whereas CSD is more appropriate for bulk data transfers, such as e-mail downloading. Unlike with CSD, you need not worry with GPRS about a constantly running usage meter that's logging your online time.

INTERNAUGHT

Because my experiences with the phones as wireless modems were so mixed and because the point of the project was to test the phones' all-in-one capabilities, I thought I'd next try out their built-in e-mail and Web-browser functions. I didn't get far down the path to e-mail nirvana, however. After tediously entering server URL, log-in name, password and other details into the tiny keypad, I found that I couldn't log into either Pacific Bell's POP3 (Post Office Protocol 3) incoming server or Yahoo's SMTP (Simple Mail Transfer Protocol) outgoing server.

You might ask why I have multiple service providers. The reason is that I knew from experience that I could access Pacific Bell's SMTP server only if I connected to Pacific Bell's network or to a partner's roaming service. (Pacific Bell uses this tactic as a spam-prevention mechanism.) If I'm not on a Pacific Bell-sanctioned connection, I instead send e-mail through Yahoo's SMTP server with the reply-to address set to bdipert@pacbell.net and incoming Yahoo e-mail also set to forward to Pacific Bell.

I'd never had problems logging into Pacific Bell's POP3 server from any Internet connection, until now. Sony Ericsson confirmed that neither Pacific Bell nor Yahoo's e-mail systems are accessible from Cingular, but declined to provide specifics. One possible reason for the Yahoo problem is that the SMTP server—also for spam suppression—requires log-in and password authorization; the cell phone supports log-in and password data only for the POP3 server. But I can't explain the lack of Pacific Bell POP3 support.

Even if I were able to get e-mail working on the phone, I'm skeptical of its practical value. I receive approximately 300 e-mails a weekday, a volume that would quickly swamp the phone's limited memory. An increasing—and increasingly annoying—percentage of those e-mails are



(a)

FM radio (a) and MP3 player (b) accessories expand the phones' audio capabilities (courtesy Sony Ericsson).

encoded in HTML or Word formats, neither of which the phone can decode, instead of good old ASCII. The phones' e-mail software doesn't support proprietary networks, such as America Online, either. And if the e-mail volume didn't overwhelm the phones' storage capacity, the requisite file attachments—which, again, the phone can't decode—would.

Then, the pragmatic issue of data entry emerges. Typing a single character, due to the multiplexing of multiple characters on a single key, can require a dozen or more consecutive rapid-fire key press-

Figure 5



(b)

es (even more if you overshoot the character you want and have to circle around again or instead choose to delete the errant character and reattempt entry). You also need to briefly pause between entering characters that share the same key and press an additional key to signify uppercase versus lowercase. The optional predictive T9 text-input mode attempts to guess what word you want from the first few characters you enter, but it's more often wrong than right. Sony Ericsson makes a miniature keyboard, called a chatboard, which attaches to the bottom of the phone and simplifies data entry—at least for small-handed and narrow-fingered folks like me (Figure 3).

I'm more enthusiastic about WAP, but only marginally so. Sure, it's neat to check stock prices, movie start times, sports scores, and other breaking news right from the phone. But after having browsed the World Wide Web on rich and high-resolution computer displays for nearly a decade, I felt like I was taking several big steps backward in perusing a text-only screen over thumb-sized monochrome or limited-color LCDs. I felt a bit ripped off, too, when I discovered that a lot of the WAP content I might want to access was available only for a fee above and

TABLE 2—GPRS CLASSES

Class	Download	Upload	Maximum slots
1	One	One	Two
2	Two	One	Three
3	Two	Two	Three
4	Three	One	Four
5	Two	Two	Four
6	Three	Two	Four
7	Three	Three	Five
8	Four	One	Five
9	Three	Two	Five
10	Four	Two	Five
11	Four	Three	Five
12	Four	Four	Five
13	Three	Three	Unlimited
14	Four	Four	Unlimited
15	Five	Five	Unlimited
16	Six	Six	Unlimited
17	Seven	Seven	Unlimited
18	Eight	Eight	Unlimited
19	Six	Two	Unlimited
20	Six	Three	Unlimited
21	Six	Four	Unlimited
22	Six	Four	Unlimited
23	Six	Six	Unlimited
24	Eight	Two	Unlimited
25	Eight	Three	Unlimited
26	Eight	Four	Unlimited
27	Eight	Four	Unlimited
28	Eight	Six	Unlimited
29	Eight	Eight	Unlimited

beyond what I was already paying Cingular for my rate plan.

BELLS AND WHISTLES

All three phones offer optional voice-activated dialing after you first record your voice saying the name associated with a contact. When a call comes in from that contact, the phone also plays back your recording. Voice-activated dialing is particularly useful with headsets, which have no keypads for punching in phone numbers, and, although I haven't tried it yet, my wife says it works surprisingly well. She's got a lot of experience with voice-recognition software, though, and, given that voice-activated cell phones are portrayed in an unflattering manner in several recent films, I wonder whether she inadvertently avoided potential problems via her choice of words. Would, for example, the phone be as adept in distinguishing between "mom" and "home" as it is in discerning between "mom" and "house"?

Given my lack of enthusiasm for phone-resident e-mail, it's doubtlessly no surprise that I'm not excited about SMS (Short Message Service) and chat. In this regard, though, I admit that I'm probably in the minority. SMS and chat interaction, after all, constitute a significant percentage of overall GSM-network usage in Europe, and the popularity of computer-based instant messaging in the United States, especially among teens, bodes well for cell phone's future. I still don't get the appeal, though. The 160-character per-message restriction leaves little room to say anything substantial, especially for someone as long-winded as I am. You *can* create 960-character messages, but the user receives them in separate chunks. And you can attach pictures, sounds, melodies, or animation to a message, but they represent wasted bandwidth if the recipient's phone lacks support for these features.

The T68i even offers next-generation—and, therefore, even more narrowly supported—MMS (multimedia-messaging-service) capability for creating messages that natively incorporate text, sounds, still images, and video streams. More generally, what of the T68i's 256-color display, which goes hand in hand with its support for color-capable WAP 2.0? Cosmetically, it's beautiful (except outdoors, when ambient light washes out whatever's being displayed on it). Func-



Figure 6

What will be the winning starting point to the all-in-one destination: a phone or a PDA? (courtesy Microsoft)

tionally, it's of limited value, and, to the extent that it reduces battery life, using it might be counterproductive. Along similar lines, though, I admit that I prefer my color-LCD-equipped Casio Pocket PC to its monochrome iPaq sibling.

Yes, I can attach an ultralow-resolution camera to the phone and use it to send pictures to other users, create custom backgrounds and screensavers, and perform other imaging-related tasks (Figure 4). I can also download software from the Sony Ericsson Web site that lets me create phone-compatible images from existing pictures, as well as custom tunes that play when calls come in. But who has the time for this frivolity? Plenty of people, apparently; sales of ring tones and screensavers—both downloadable, often for a fee, from Cingular, Sony Ericsson and other WAP sites—custom faceplates, and other accessories, such as FM radios and MP3 players, are booming (Figure 5). Also for a fee, you can play simple online games with others through your phone.

And what of the PDA-like calendar, contacts, and tasks functions? For me, they're useless, because the databases are too small. Sony Ericsson in conjunction with Extended Systems offers free software that synchronizes your phone with Outlook, but I have more than 2500 contacts in my Outlook database. The T68i, in contrast, handles only a few hundred contacts; the exact number depends on how much information, which can include a picture and a custom incoming-

ring tone, you store per contact, and the other, older phones store even fewer contacts. Is that number enough for most users? The answer is most likely "yes." For me, a phone-enhanced PDA such as one of the admittedly bulkier Pocket PC Phone units might make more sense (Figure 6).

STUCK IN FIRST GEAR

Alas, I don't see a clear path to eliminating one or multiple pieces of electronics gear from my travel portfolio any time soon. But for an increasing percentage of users whose e-mail loads and contact lists are smaller than mine, an advanced cell phone, perhaps in conjunction with a handheld PC or a PDA and detachable keyboard, just might fit the bill (Reference 5). One word of warning, though: In the earlier descriptions of my travails, I might not have conveyed just how many hours' worth of e-mail and phone communication, newsgroup and Web-site research, user-manual reading and rereading, and often-frustrating experiment repetitions it took for me even to get to this point.

If I hadn't possessed multiple phones and multiple Cingular accounts whose behaviors I could compare, I doubt that I would have made any significant progress on this project. If I had wanted only to access e-mail and WAP directly from the phone and if I relied on Cingular to configure the phone rather than doing it myself, my task probably would have been simpler. Cingular claims that purchasing one of its \$59.99 Data Connect kits would have eased my computer-access trials and tribulations. Any sarcasm you might be detecting at this point is intentional. Setup difficulty is only one of the many reasons that I'm skeptical that you'll see economical and, therefore, pervasive 2.5G or faster wireless-WAN (wide-area-network) capability in the near future. Look at the facts. GSM Data is, bandwidthwise, where land-line modems were 20 years ago. AMPS is due for phase-out beginning in five years per a recent FCC (Federal Communications Committee) decision, and, with its demise, CDPD will also disappear. GPRS is fraught with configuration nightmares, uptime shortcomings, and ill-trained support personnel and gets you only halfway to land-line-modem-bandwidth speed. Next-generation GSM EDGE (enhanced data rates for GSM evolution),

CDMA2000, and WCDMA (wideband CDMA) promise higher bandwidth and, I hope, a more consumer-friendly usage experience. Given, though, that a service provider can squeeze dozens or hundreds of voice calls into the bandwidth required for a single high-speed data connection, the economic viability of *any* 3G (third-generation) wireless data service remains dubious to me.

Cingular and its service competitors are frantically signing up as many subscribers as they can to boost revenues while, to minimize costs and maximize profits, making minimal corresponding upgrades to the network. This situation is clear to anyone attempting to make a phone call in Silicon Valley between 7 a.m. and 10 p.m. Sony Ericsson and its handset competitors are equally fiscally constrained. Everyone's laying off employees and pondering whether they need to acquire or be acquired by another company. The dot.com bubble has burst, and the bills have come due.

What about wireless broadband alternatives? Ricochet Networks last year filed for bankruptcy protection. Even though Aerie Networks bought the Ricochet assets for pennies on the dollar, the new owners must still pay use fees for all those telephone poles containing microcells, as well as maintenance and support costs, making the ultimate success of the Ricochet network's resurrection unclear. The healthiest technology is perhaps 802.11b, but it's also a patchwork of incompatible and nonoverlapping nodes, with each provider trying to sign you up for a subscription or, in the case of many free providers, redistributing bandwidth in violation of the ISP (Internet-service-provider) contract. We're a long way from *The Jetsons*. Which is OK. That means I've got plenty to write about for years to come.

Forget about data services for a moment, though, and the cell phone's outlook brightens. All three phones I tested in this project are significantly lighter, smaller, and therefore more portable than the CF388. They all have considerably longer battery life, too. The T68i specifications on Sony Ericsson's Web site quote as much as 12 hours of talk time and 390 hours of standby time; that's more than two weeks between charges. Bluetooth and infrared-transceiver integration in the T68i is convenient and noticeably improves its battery

life as compared with reliance on external expansion modules in the T28 World and T61z. And you can use the T28 World, a dual-mode phone, and the T68i, a trimode device, with both US and international GSM networks, a capability that I hope to try out the next time I'm trekking in Nepal.

So kudos to the engineers at Sony Ericsson for a job well-done. Continue to focus on what a cellular phone first and foremost is (a voice phone) and isn't (a computer). Feel free to ignore those marketing folks who try to tell you otherwise. And Cingular? Please fix your network, whose numerous implementation shortcomings hinder its noteworthy potential. □

REFERENCES

1. Dipert, Brian, "To go where no PDA has gone before," *EDN*, July 25, 2002, pg 27.
2. Dipert, Brian, "Running interference," *EDN*, Aug 22, 2002, pg 24.
3. "Device and Software Settings: Wireless Internet, Wireless Internet Express, and Data Connect (WAP and ISP), Version 1.1," Cingular Wireless, July 17, 2002, <http://alliance.cingularinteractive.com/dev/cda/files/download/Cingular%20Device%20Software%20Settings%20v1.1.071702.pdf>.
4. Dipert, Brian, "Wireless network's fast, on-the-go access makes waves," *EDN*, Nov 8, 2001, pg 49.
5. Schweber, Bill, "In praise of Microsoft," *EDN*, May 30, 2002, pg 27.

ACKNOWLEDGMENTS

I'm grateful to Sony Ericsson's product services operations manager, Jack Langsam, to John Navas from the Navas Group, and to the participants in the alt.cellular.cingular and alt.cellular.ericsson newsgroups, whose assistance and information were of great benefit.

AUTHOR'S BIOGRAPHY



Technical editor Brian Dipert wonders whether he should forget about all this 2.5G and 3G wireless technobabble and just learn Morse Code instead. You can reach dot-dot-dot-dot dot-dot dash-dash at 1-916-454-5242, fax 1-916-454-5101, bdipert@edn.com, and www.bdipert.com.